Inula viscosa extracts and essential oils to fight *Plasmopara viticola*

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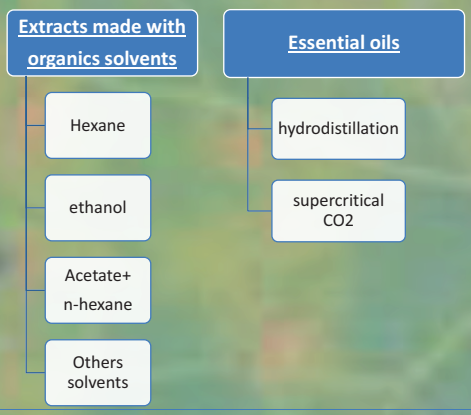
The plagues have been a real problem since the beginning of the agriculture. Since millennia ago we have been using chemical products to protect us against them. But recently, we discovered that they are dangerous for our health and the environment. So the search for new efficient, cheap and ecological have started and it's in a booming.

The main objective: is to evaluate the possibility to use the *Inula viscosa* extracts and essential oils to protect our cultured plants from the plagues.

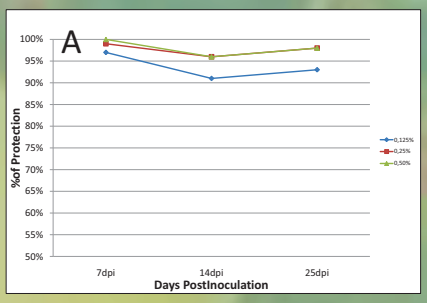


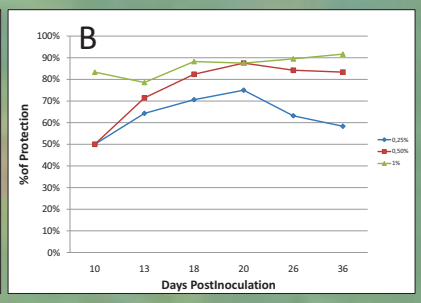
We look for papers that have already analyze the composition of this extracts too see if the extracts are too much different even if they proceed from the same plant.

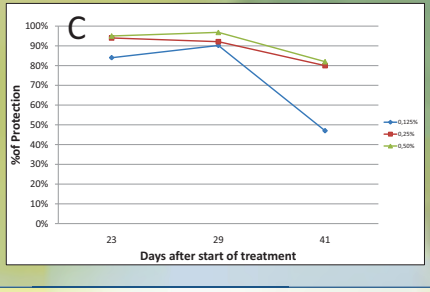
We also searched for papers that experiment *in-vivo* the use of the extracts from *I.viscosa* to protect the vines from the *Plasmopara viticola*, that produce the downy mildew. We choose this fungus as a representing of the other.

Components	Hydrodistillation Jordan	Hydrodistillation Turkey	Hydrodistillation Corsica	Hydrodistillation Sardinia	supercritical CO2 Sardinia	solvent hexane Turkey
(E)-Caryophyllene					3,50%	
(E)-Nerolidol					4,50%	
(E)-Sesquilavandulol					4,40%	
8-Isobutyryloxy isobornyl isobutyrate					13,10%	
Borneol		25,20%				20,80%
Bornyl acetate		19,50%				48,70%
Caryophyllene oxide	2,57%	1,50%		2,00%	8,20%	
cis-Carveol					3,90%	
cis-β -Guaiene				3,40%		
Costic acid			4,80%			
E-Nerolidol	19,75%					
Eudesm-6-en-4α-ol			6,20%			
Eudesma-3,11(13)-dien-12-oic acid			43,70%			
Eudesma-4,11(13)-dien-12-oic acid			10,90%			
Fokienol	20,87%		21,10%			
Geranial					5,60%	
Globulol	1,79%			16,80%	15,00%	
Khusimol	1,80%			2,60%		
Isobornyl acetate		22,50%				
Selin-11-en-4 α-ol					1,10%	
Valerianol				12,00%		
Viridiflorol					8,30%	
δ –Cadinene	0,49%		0,20%	3,90%		
α-Eudesmol	2,68%		2,20%	2,00%	3,20%	
α-Vetivone	3,60%					
β –Eudesm-6-en-4α-ol	5,64%					

Results I: As seen in the table, all the extracts have different composition. But some similarities are seen. α-Eudesmol is in all but the ones from Turkey and Caryophyllene oxide is in all but the ones from Corsica. Other important elements are the Fokienol, that we find in high concentration in 2 oils; Borneol and Bornyl Acetate, that is found exclusively and in high concentration at the extracts from Turkey; and Globulol, that is found in high concentration only at the extracts made with plants from Sardinia.







These graphics show how much protection against grape downy mildew that the I.viscosa extracts offer
A- experiment to study the prevention effects of the extracts on shoots.
B- experiment to study the prevention effects of the extracts on whole vines.
C- experiment to study the protection effect against a spreading fungal infection on whole vines.

Results II: The extracts made with a mix of acetate and n-hexane as organic solvent proved in-vivo that with low concentration you can protect well newly shoots of vines from being infected with downy mildew(Fig.A). It also offer great protection in already grown vines(Fig.B), but needs a higher concentration to offer the same grade of protection.

The extracts made with ethanol as organic solvent prove that can slow down the progress of the infection easily(Fig.C).
But in this experiment we can see the importance of the weather clearly. At the first two check points the percentage of protection is similar but in the third checkpoint this percentage is lowered and it may happened because the weather was good for the growth of the fungus.

Conclusions: We can say that the use of extracts and essential oils is complicate, there are a lot of factors that can change the compositions of the extracts, even if you follow the same method of extraction. The effectiveness of the same extract can change depending the weather.
But the effectiveness of the extracts from I. viscosa has been proven to be high, at least against *Plasmopara viticola*, proving that it can be a good alternative to chemical products.